CHAPTER 1

CONSTRUCTION SUPPORT

INTRODUCTION

As a second class petty officer your duties and responsibilities will increase in the area of construction support. This chapter will discuss some of these responsibilities, such as the Advanced Base Functional Components System, shoring and excavation safety, project planning, network analysis, timekeeping, quality control, and hazardous materials.

ADVANCED BASE FUNCTIONAL COMPONENTS (ABFC)

The Advanced Base Functional Components (ABFC) System consists of two general-purpose publications: *Table of Advanced Base Functional Components with Abridged Initial Outfitting Lists,* OPNAV-41P3, and *Facilities Planning Guide,* Volumes I and II, NAVFAC P-437.

The ABFC System was developed to provide support facilities to constantly changing tactical and strategic situations. A modular or building-block concept was developed. Components were needed that would incorporate men, materials, equipment, and facilities designed and developed to fulfill specific functions, no matter where the components were placed. The Navy ABFC System is based on the early experience in advanced base planning and shipment used in World War II with improvements brought about by experiences learned in Korea, Vietnam, and the Persian Gulf.

The Navy ABFC System is the quantitative expression and measurement of planning, procurement, assembly, and shipping of material and personnel that is needed to satisfy facility support requirements. The basic groupings of the ABFC System are (1) **component,** a complete unit; (2) **facility,** a portion of a complete component; and (3) **assembly,** a portion of a facility. These simple definitions and the interaction of these three units will be fully explained later in this chapter.

OPNAV 41P3

The *Table of Advanced Base Functional Components with Abridged Initial Outfitting Lists (ABIOL),* OPNAV 41P3, is a detailed itemized line-item printout of the material in each ABFC. Each system command (SYSCOM)/bureau is responsible for maintaining a detailed list of that portion of the *ABIOL* of an ABFC for which it has been assigned contributory responsibility.

NAVFAC P-437

The *Facilities Planning Guide,* NAVFAC P-437, is the basic document that identifies the structures and supporting utilities of the ABFC System. It consists of two volumes.

Volume I contains reproducible engineering drawings organized in three parts—Part *I, Component Site Plans,* indexed by component designation; Part II, *Facility Drawings and Networks,* indexed by facility number; and Part III, *Assembly Drawings,* indexed by assembly numbers.

Volume II contains the detailed data display for each component, facility, and assembly in the ABFC System. It also has three parts. Part I quantifies and describes, by DoD category code, the facilities requirements for each component. Part II quantifies and describes, by assembly number, the assembly requirements for each facility. Part III quantifies line-item requirements, by national stock number (NSN), for each assembly.

Other information used for planning, such as the crew size, man-hours by skill, land area, and fuel necessary to make a component, facility, or assembly operational is contained in the guide.

The NAVFAC P-437 includes facilities and assemblies that are not directly related to components shown in the OPNAV P-41P3. These predesigned facilities and assemblies give the planner alternatives for satisfying contingency requirements when the callout of a complete component is not desired. For the purpose of compatibility with other DOD planning systems, the NAVFAC P-437 has been oriented to the standard DOD category codes for classifying real property of the Navy, as listed in *Department of the Navy Facility Codes,* NAVFAC P-72. The cardinal category codes are shown in table 1-1.

Table 1-1.—Codes and Categories for Real Property

CODES	CATEGORIES
100	Operations and Training
200	Maintenance and Production
300	Research. Development, and Evaluation
400	Supply
500	Hospital and Medical
600	Administrative
700	Housing and Community Support
800	Utilities and Ground Improvements
900	Real Estate

A facility required for an electrical power plant will be found in the 800 series, Utilities and Ground Improvements. The assemblies contained within each of these facilities consist of a grouping of line items at the national stock number level that, when assembled, will perform a specific function in support of the facility. These assemblies are functionally grouped in such a way that the assembly relates to the Seabee skill required to install it. These groupings are shown in table 1-2.

USING THE P-437

When you are using the ABFC System, remember that it is possible to tailor it to serve your specific needs. Understand your exact requirements and mission. Choose components, facilities, or assemblies that fit or can be tailored to meet your desired goals. Verify stock numbers and descriptions by using appropriate stock lists. Verification is done automatically when components, facilities, or assemblies are ordered.

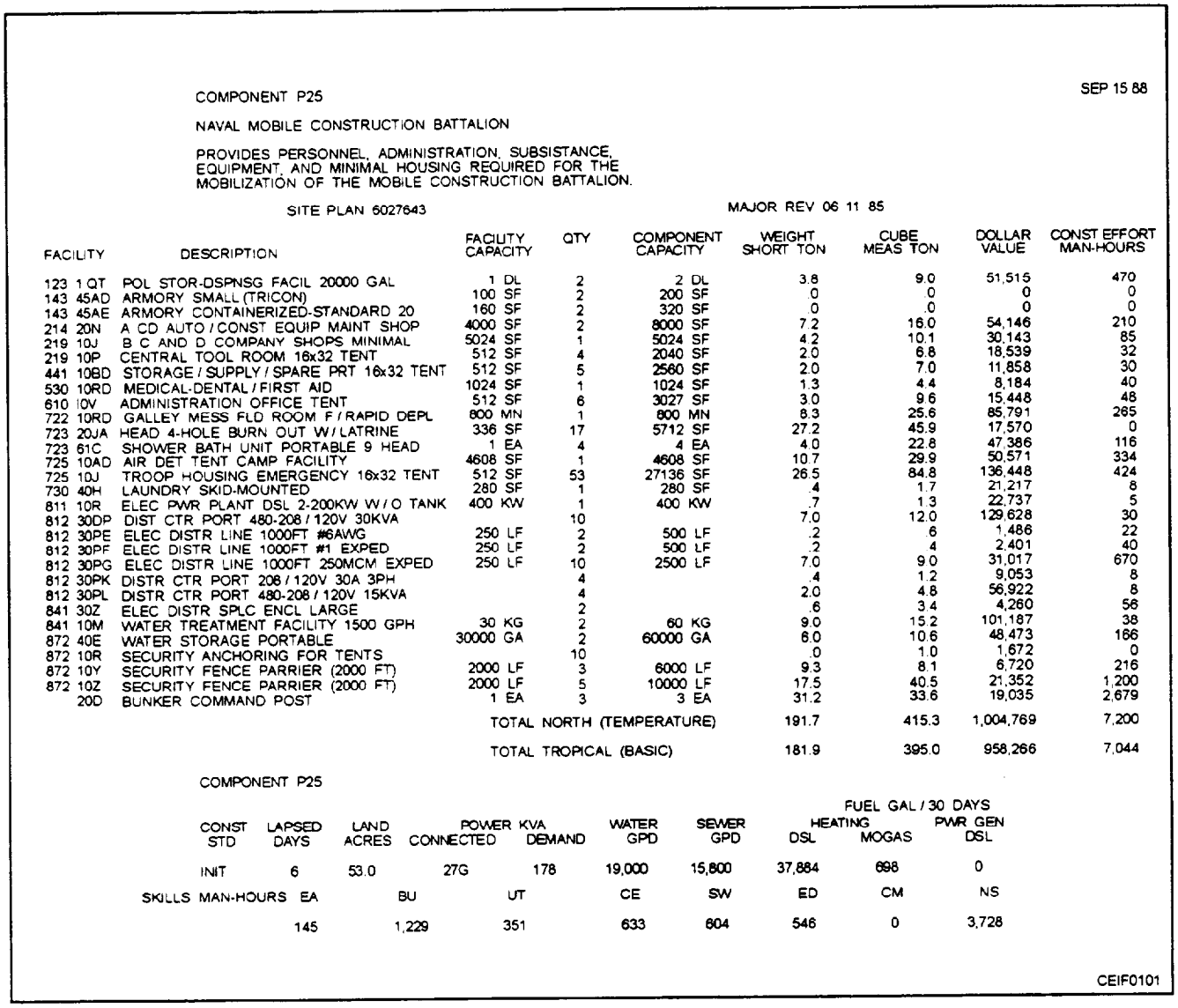
A sample from volume II of NAVFAC P-437 shows the structure and type of information provided. Figure 1-1 shows the P-25 component, Naval Mobile Construction Battalion. The component containsa listing of facilities by category code.

One such facility is the electric power plant diesel, 2-200 kW without tank, facility, 811 10R. Figure 1-2 shows this **facility.** Note that within the facility the necessary assemblies are identified.

Figure 1-3 shows an assembly from within facility 811 10R. The listing for assembly 32602, titled "PANELBOARD ASSY 1200A WEATHER-

Table 1-2.—Assemblies Functionally Grouped to Seabee Skills

DESCRIPTION	NUMBER START	SEQUENCE STOP
Builder (BU) Oriented	10,000	19,999
Utilitiesman (UT) Oriented	20,000	29,999
Construction Electrician (CE) Oriented	30,000	39,999
Steelworker (SW) Oriented	40,000	49,999
Equipment Operator (EO) Oriented	50,000	54,999
Waterfront Equipment	55,000	57,999
Underwater Construction and Diving Equipment	58,000	59,999
Operational Supplies	60,000	62,499
NBC Warfare	65,000	67,499
Personnel-Related Supplies	67,500	69,999
Unassigned at Present	70,000	79,999
Shop Equipment including Maintenance Tools	80,000	80,999
Unique ABFC Tool Kits	81,000	81,999
NCF TOA Construction Tools and Kits (Power Tools)	82,000	82,499
NCF TOA Construction Tools and Kits (Electric)	82,500	82,999
NCF TOA Construction Tools and Kits (Miscellaneous)	83,000	83,999
NCF TOA Construction Tools and Kits (Rigging)	84,000	84,999
Shop Equipment (ABFC Unique)	85,000	87,499



COMPONENT P25 SEP 15 88

NAVAL MOBILE CONSTRUCTION BATTALION

PROVIDES PERSONNEL, ADMINISTRATION, SUBSISTANCE, EQUIPMENT, AND MINIMAL HOUSING REQUIRED FOR THE MOBILIZATION OF THE MOBILE CONSTRUCTION BATTALION.

SITE PLAN 6027643 MAJOR REV 06 11 85

FACILITY	DESCRIPTION	FACILITY CAPACITY	QTY	COMPONENT CAPACITY	WEIGHT SHORT TON	CUBE MEAS TON	DOLLAR VALUE	CONST EFFORT MAN-HOURS
123 1QT	POL STOR-DSPNSG FACIL 20000 GAL	1 DL	2	2 DL	3.8	9.0	51,515	470
143 45AD	ARMORY SMALL (TRICON)	100 SF	2	200 SF	.0	0	0	0
143 45AE	ARMORY CONTAINERIZED-STANDARD 20	160 SF	2	320 SF	.0	.0	0	0
214 20N	A CD AUTO / CONST EQUIP MAINT SHOP	4000 SF	2	8000 SF	7.2	16.0	54,146	210
219 10J	B C AND D COMPANY SHOPS MINIMAL	5024 SF	1	5024 SF	4.2	10.1	30,143	85
219 10P	CENTRAL TOOL ROOM 16x32 TENT	512 SF	4	2040 SF	2.0	6.8	18,539	32
441 10BD	STORAGE / SUPPLY / SPARE PRT 16x32 TENT	512 SF	5	2560 SF	2.0	7.0	11,858	30
530 10RD	MEDICAL-DENTAL / FIRST AID	1024 SF	1	1024 SF	1.3	4.4	8,184	40
610 10V	ADMINISTRATION OFFICE TENT	512 SF	6	3027 SF	3.0	9.6	15,448	48
722 10RD	GALLEY MESS FLD ROOM F / RAPID DEPL	800 MN	1	800 MN	8.3	25.6	85,791	265
723 20JA	HEAD 4-HOLE BURN OUT W / LATRINE	336 SF	17	5712 SF	27.2	45.9	17,570	0
723 61C	SHOWER BATH UNIT PORTABLE 9 HEAD	1 EA	4	4 EA	4.0	22.8	47,386	116
725 10AD	AIR DET TENT CAMP FACILITY	4608 SF	1	4608 SF	10.7	29.9	50,571	334
725 10J	TROOP HOUSING EMERGENCY 16x32 TENT	512 SF	53	27136 SF	26.5	84.8	136,448	424
730 40H	LAUNDRY SKID-MOUNTED	280 SF	1	280 SF	.4	1.7	21,217	8
811 10R	ELEC PWR PLANT DSL 2-200KW W / O TANK	400 KW	1	400 KW	.7	1.3	22,737	5
812 30DP	DIST CTR PORT 480-208 / 120V 30KVA		10		7.0	12.0	129,628	30
812 30PE	ELEC DISTR LINE 1000FT #6AWG	250 LF	2	500 LF	.2	.6	1,486	22
812 30PF	ELEC DISTR LINE 1000FT #1 EXPED	250 LF	2	500 LF	.2	.4	2,401	40
812 30PG	ELEC DISTR LINE 1000FT 250MCM EXPED	250 LF	10	2500 LF	7.0	9.0	31,017	670
812 30PK	DISTR CTR PORT 208 / 120V 30A 3PH		4		.4	1.2	9,053	8
812 30PL	DISTR CTR PORT 480-208 / 120V 15KVA		4		2.0	4.8	56,922	8
841 30Z	ELEC DISTR SPLC ENCL LARGE		2		.6	3.4	4,260	56
841 10M	WATER TREATMENT FACILITY 1500 GPH	30 KG	2	60 KG	9.0	15.2	101,187	38
872 40E	WATER STORAGE PORTABLE	30000 GA	2	60000 GA	6.0	10.6	48,473	166
872 10R	SECURITY ANCHORING FOR TENTS		10		.0	1.0	1,672	0
872 10Y	SECURITY FENCE PARRIER (2000 FT)	2000 LF	3	6000 LF	9.3	8.1	6,720	216
872 10Z	SECURITY FENCE PARRIER (2000 FT)	2000 LF	5	10000 LF	17.5	40.5	21,352	1,200
20D	BUNKER COMMAND POST	1 EA	3	3 EA	31.2	33.6	19,035	2,679
		TOTAL NORTH (TEMPERATURE)			191.7	415.3	1,004,769	7,200
		TOTAL TROPICAL (BASIC)			181.9	395.0	958,266	7,044

COMPONENT P25

CONST STD	LAPSED DAYS	LAND ACRES	POWER KVA CONNECTED	POWER KVA DEMAND	WATER GPD	SEWER GPD	FUEL GAL / 30 DAYS HEATING DSL	FUEL GAL / 30 DAYS HEATING MOGAS	FUEL GAL / 30 DAYS PWR GEN DSL
INIT	6	53.0	27G	178	19,000	15,800	37,884	698	0

SKILLS MAN-HOURS EA	BU	UT	CE	SW	ED	CM	NS
145	1,229	351	633	604	546	0	3,728

CEIF0101

Figure 1-1.—Mobilization component (P-25) for a mobile construction battalion.

PROOF," indicates by line items the national stock numbers required to make the assembly operable. Assembly listings indicate the installed or collateral equipment provided. Certain installed or collateral equipment supplied by other SYSCOMs or bureaus are not furnished with the facilities or assemblies listed in the NAVFAC P-437. They must be ordered separately.

COMPONENT P-25

A breakdown of the component P-25, as shown in figure 1-1, is as follows: a brief header describing the mission and capabilities of the component. The site plan pertaining to each component is depicted by a NAVFAC drawing number. However, drawings in volume 1, part 1, are indexed by component designation, not drawing numbers. The word *NONE* appears for components that have no site plans. The facilities required to make the component operative are listed in numerical sequence by DOD category code. The alpha suffix for each facility designator indicates differences between sizes, types, or layouts of facilities for the same functional purposes. Facility capacity is expressed in terms of the units of measure used in the NAVFAC P-72. The component capacity is a multiplication of the facility capacity and the quantity. Weight and cube are measured in normal units for export packing. Weight and construction effort are computed using The Seabee Planner's and Estimator's Handbook, NAVFAC P-405. Average construction conditions are assumed and computations are based on normal Seabee skill levels.

You compute the total of the weight, cube, and dollar value columns by adding all facilities or assemblies required in both tropical and northern

FACILITY 811 10R PLANNING FACTOR (0.4-1.5)KW/MN SEP 15 88

ELECTRIC PWR PLANT DSL 2-200KW GEN W/CESE
W/O TANK

PROVIDES UP TO 400KW OF POWER AT 416Y/240 VOLTS
OR 208Y/120 VOLTS 3-PHASE

NAVFAC DRAWING NUMBER NONE MAJOR REV 06 14 88

ASSEMBLY	DESCRIPTION	ZONE	QTY	WEIGHT POUNDS	CUBIC FEET	DOLLAR VALUE	CONST EFFORTS MANHOURS
32054	SUPPORT EQUIP F/200KW GEN ECC512801		2	48.6	1.3	145.08	0
512801	GENERATOR 200KW		2	210.0	.0	988.80	0
32602	PANELBOARD ASSY 1200A WEATHERPROOF		1	1,157.7	48.1	21,533.17	4
32604	PARALLELING CABLE F/GENERATORS		1	4.0	4.0	69.72	1
		SHORT TON	MEAS TON				
	TOTAL NORTH (TEMPERATURE)	.7	1.3	1,420.3	53.4	22,736.77	5
	TOTAL TROPICAL (BASIC)	.7	1.3	1,420.3	53.4	22,736.77	5

FACILITY 811 10R PRIMARY UNIT OF MEASURE 400 KW SECONDARY UNIT OF MEASURE 0

CONST STD	LAPSED DAYS	LAND ACRES	POWER KVA CONNECTED	POWER KVA DEMAND	VOLTS	PHASE	WATER TOT. GPD	WATER PEAK GPD	SEWER GPD	RECOV. CODE
INIT	2	00	0	0	0	0	0	0	0	A

FUEL (GAL/30 DAYS) HEATING DSL	MOGAS	PWR GEN DSL	SKILLS MANHOURS EA	BU	UT	CE	SW	EO	CM	NS
0	0	0	0	0	0	4	0	1	0	0

CEIF0102

Figure 1-2.—Typical listing of a facility, facility 811 10R.

ASSEMBLY 32602 ZONE
PANELBOARD WEATHERPROOF 480 VOLTS 3-POLE 3-WIRE
1200 AMPERE

JUN 15 90
32602

NAVFAC DRAWING NUMBER 6002625

COG	STOCK NUMBER	DESCRIPTION	UI	QTY	WEIGHT POUNDS	CUBIC FEET	DOLLAR VALUE
9G	5975-00-878-3791	ROD, GROUND, 3-3FT SECTIONS, 5/8N DIA, STEEL, COPPER CLAD, W/DRIVING STUD, GROUND WIRE CLAMP AND TERMINAL	EA	1	7.00	.0840	15.42
	1	LUG AND 6FT NO.6 AWG BARE STRANDED COPPER WIRE					
9N	5999-00-257-7025	CLAMP, GND 3/4 ROD 2-8 SOL	EA	1	.47	.0100	.43
2C	6110-00-213-8078	PANELBOARD, POWER DISTRIBUTION, PORTABLE, WEATHER-	EA	1	500.00	42.0000	7,800.00
	8	PROOF, 400 KILOWATT, INPUT-480 OR 208 V., 3-PHASE,					
	8	4-POLE, 5-WIRE, 60 HZ, BUS CAPACITY-1200 AMPS, 4-3 POLE					
	8	INPUT AND 8-3 POLE OUTPUT CIRCUIT BREAKERS.					
	8	APPENDIX E OF PD APPLIES	FT				
9Z	6145-00-129-9320	WIRE COP SOL 6 AWG SOFT BARE	FT	15	1.20	.0225	2.25
9Z	6145-01-212-0272	WIRE ELECTRICAL #4/0 AWG EXPED		600	648.00	6.0000	1,650.00
	ASSEMBLY 32602			TOTAL	1,157.73	48.1365	9,468.62

FUEL (GAL/30 DAYS) HEATING DSL	MOGAS	PWR GEN DSL	EA	SKILLS MANHOURS BU	UT	CE	SW	EO	CH	NS	CONST EFFORT MANHOURS
0	0	0	0	0	0	3	0	1	0	0	4

NOTE -- CREW SIZE: 1 CE, 1 EO

CEIF0103

Figure 1-3.—Typical listing of an assembly.

climates plus the unique requirements for either tropical or northern areas.

Summary data located below the component facility listings lists the following:

1. Construction standards (const std) are grouped into two classifications: initial and temporary.

a. INITIAL (INIT)—Duration of requirement less than 6 months.

b. TEMPORARY (TEMP)—Duration of requirement from 6 to 60 months.

2. Days of construction duration (lapsed days) are based on job requirements, optimum construction crew size. and full-material availability.

3. Often the land requirements, in acres, based on the assumed plot plan, will not be followed exactly because of terrain or existing buildings. The idealized plot plan was developed to design supporting utility systems. The material contained in the utility facilities has been increased to allow for variation in terrain.

4. The connected electrical load in kVA has been computed based on knowledge of *ABIOL* or Table of Allowance (TOA) contents. A load diversity factor has been applied to compute the kVA demand. Water and sewer demand are based on *ABIOL* or TOA contents and the utility systems designed to this criteria.

5. Compute 30-day requirements for installed engine-driven or fuel-fired equipment only. No allowance for automotive, construction, weight handling, and other jobsite support equipment fuel is included. Fuel is not provided when facilities or assemblies are shipped. NAVSUP provides fuel as a contribution when whole components are shipped.

6. The skill requirements are designated by Seabee (OF-13) ratings and are expressed in man-hours as computed for each facility.

FACILITY 811 10R

Figure 1-2 shows atypical facility entry in part 2 of volume I–electric power plant diesel 2-200 kW generators, without tank, facility 811 10R. Adjacent to the facility number, the heading shows the JCS planning factor applied. The header also describes the basic capability of the facility. The NAVFAC drawing number is shown for reference purposes. All drawings in volume I, part 2, are indexed by facility number.

The assemblies required to make the facility functionally operational are listed in assembly-number sequence. These numbers were derived from the prime trade involved in the construction. The 30,000 series indicates Construction Electricians; the 50,000, Equipment Operators.

Following a brief description of the assembly is the zone code. For facilities or assemblies that are designed for use in both northern and tropical zones, the zone column is usually left blank. However, assemblies required for Arctic operation are designated code “N.” The quantity given is a multiplier, indicating the number of assemblies to be ordered.

Weight and cubic feet are measured in normal terms for export packing. Weight, cube, and dollar value reflect totals for each line. Construction estimates are computed in the same manner as are components.

Summarized data is the same as that used for components with the following exceptions. In addition to primary facility capacity, secondary capacity, as described in NAVFAC P-72, is included. This is used, for example, in the 700 series of facilities where the primary capacity is expressed in men, and the secondary, in square feet.

The recoverability code is a broad indication of the relocatability or recoverability. The code "A" indicates total recoverability, and "D" indicates a disposable facility. Details are found in table 1-3, Recoverability Codes.

ASSEMBLY 32602

Figure 1-3 shows a typical entry for an assembly. This assembly provides the necessary material for the installation of a 200-kilowatt generator. Header information is the same as that for a facility. Assembly line-item requirements are displayed by cognizance symbol and national stock number. The unit of issue, weight, cube, and dollar value are extracted from supply files once the requirement data is entered. This data changes often, but frequent changes will not be made in the *Facilities Planning Guide* for stock numbers with minor price-level changes.

ORDERING

Components, facilities, or assemblies can be ordered. Components are usually ordered only under a mobilization situation and requested through the CNO. Facilities and assemblies can be ordered without CNO approval if reimbursement is provided. Requests for release are forwarded to NCBC, Port Hueneme. Attention is directed to the *Facilities Projects Manual,* OPNAVINST 11010.20 (Series), regarding project approvals for peacetime use and to *Procurement, Lease, and Use of Relocatable Buildings,* OPNAVINST 11010.33 (Series), (DODINST 4165.56), regardingthe relocatable building program.

INDEX OF FACILITIES

Suppose there is a requirement for an electrical distribution system underground. To determine what is available in the ABFC System to satisfy the requirement, look in volume 2, part 2, *Index of Facilities,* under the 800 series (Utilities and Ground Improvements), as shown in figure 1-4. If an approximate 11,000-foot system is needed, facility 812 30AB can be used; see figure 1-5.

Table 1-3.—Recoverability Codes

CODE	DEFINITION
A. Relocatable:	Designed for specific purpose of being readily erected, disassembled, stored, and reused. includes tentage.
B. Pseudo-Relocatable:	Not specifically designed to be dismantled and relocated, but could be, with considerable effort and loss of parts. Rigid-frame building included.
C. Nonrecoverable:	A structure not designed to provide relocatability features or one where the cost of recovery of the shelter exceeds 50% of the initial procurement cost. Bolted tanks and steel bridges included.
D. Disposable:	Those temporary structures having low acquisition and erection costs which are not designed for relocation and reuse and may be left on site or destroyed, such as SEAHUNTS.

EXCAVATIONS AND SHORING

Working in, working around. or directing a crew in a trenching or excavation job can be dangerous. The following paragraphs will give you some of the accepted engineering requirements and practices. Think safety, not only for your workers but for the other persons that may encounter your work area.

EXCAVATIONS

Preplanning before starting any excavation will save time and avoid costly mistakes. Give attention to personal safety equipment, underground utility installations, personnel/vehicular traffic interruptions, security, and public safety. Make sure your crew is aware of the safe working area around a specific piece of excavating equipment. Set up daily inspections of excavations for possible cave-ins or slides. Moving ground must be guarded by a shoring system, sloping of the ground, or some other equivalent means. Excavated or other materials must not be stored closer than 2 feet from the edge.

When crews are working in trenches 4 feet or more in depth, access into or exits out of excavations should be by ramps, ladders. stairways. or hoists. Crew members should not jump into trenches or use bracing as a stairway.

Banks more than 5 feet high must be shored or laid back to a stable slope, or some other equivalent means of protection must be provided where crew members may be exposed to moving ground or cave-ins. Refer to figure 1-6 as a guide in sloping of banks.

Sides of trenches in unstable or soft material, 5 feet in depth, are required to be shored, sheeted, braced, sloped, or otherwise supported by sufficient strength to protect the crew members working within them.

Sides oftrenches in hard or compact soil, including embankments, must be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length.

SHORING

The determination of the angle of repose and design of the supporting system must be based on careful evaluation of many features: depth or cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying

INDEX OF FACILITIES
ALPHABETIC

JUN 15 90

FACILITY	DESCRIPTION	CAPACITY PRIMARY	CAPACITY SECONDARY	DRAWING	PAGE
811 10CN	ELEC PWR PLANT DSL 1-100KW W/PLWT NK	100 KW		6027582	
811 10AA	ELEC PWR PLANT DSL 1-15KW W/PLWT NK	15 KW		6139176	
811 10AE	ELEC PWR PLANT DSL 1-30KW W/PLWT NK	30 KW		6139175	
811 10AJ	ELEC PWR PLANT DSL 1-60KW W/PLWT NK	60 KW		6139174	
811 10TY	ELEC PWR PLANT DSL 2-100KW W/CESE	200 KW		NONE	
811 10AP	ELEC PWR PLANT DSL 2-100KW W/PLWT NK	200 KW		6139173	
811 10AB	ELEC PWR PLANT DSL 2-15KW W/PLWT NK	30 KW		6139176	
811 10R	ELEC PWR PLANT DSL 2-200KW W/O TANK	400 KW		NONE	
811 10AU	ELEC PWR PLANT DSL 2-200KW W/PLWT NK	400 KW		6139179	
811 10AE	ELEC PWR PLANT DSL 2-30KW W/PLWT NK	60 KW		6139175	
811 10AK	ELEC PWR PLANT DSL 2-60KW W/PLWT NK	120 KW		6139174	
811 10AR	ELEC PWR PLANT DSL 3-100KW W/PLWT NK	300 KW		6139173	
811 10CR	ELEC PWR PLANT DSL 3-100KW W/PLWT NK	300 KW		6027582	
811 10AC	ELEC PWR PLANT DSL 3-15KW W/PLWT NK	45 KW		6139176	
811 10AV	ELEC PWR PLANT DSL 3-200KW W/PLWT NK	600 KW		6139179	
811 10AG	ELEC PWR PLANT DSL 3-30KW W/PLWT NK	90 KW		6139175	
811 10AL	ELEC PWR PLANT DSL 3-60KW W/PLWT NK	180 KW		6139174	
811 10AW	ELEC PWR PLANT DSL 4-200KW W/PLWT NK	800 KW		6139179	
811 10BC	ELECTRIC POWER PLANT DIESEL 1-10KW	10 KW		NONE	
811 10CA	ELECTRIC POWER PLANT DIESEL 1-15KW	15 KW		6027585	
811 10CJ	ELECTRIC POWER PLANT DIESEL 1-60KW	60 KW		6027583	
811 10BD	ELECTRIC POWER PLANT DIESEL 2-10KW	20 KW		NONE	
811 10CU	ELECTRIC POWER PLANT DIESEL 2-200KW	400 KW		6027581	
811 10CF	ELECTRIC POWER PLANT DIESEL 2-30KW	60 KW		6027584	
811 10BB	ELECTRIC POWER PLANT DIESEL 2-5KW	10 KW		NONE	
811 10CK	ELECTRIC POWER PLANT DIESEL 2-60KW	120 KW		6027583	
811 10CC	ELECTRIC POWER PLANT DIESEL 3-15KW	45 KW		6027585	
811 10CY	ELECTRIC POWER PLANT DIESEL 3-200KW	600 KW		6027581	
811 10CG	ELECTRIC POWER PLANT DIESEL 3-30KW	90 KW		6027584	
811 10CL	ELECTRIC POWER PLANT DIESEL 3-60KW	180 KW		6027583	
811 10CW	ELECTRIC POWER PLANT DIESEL 4-200KW	800 KW		6027581	
811 10CM	ELECTRIC POWER PLANT DIESEL 4-60KW	240 KW		6027583	
811 10P	ELECTRIC POWER PLANT DIESEL 5-200KW	1000 KW	2+50 SF	6139179	
811 10TA	ELECTRIC POWER PLANT GED 5KW	5 KW		NONE	
811 45A	ELECTRIC PWR PLANT 2-750KW DIESEL	1500 KW		NONE	
812 30AB	ELECTRICAL DISTRIBUTION LINE-UGND	11000 LF		NONE	
812 30AD	ELECTRICAL DISTRIBUTION LINE-UGND	4200 LF		NONE	
812 30U	ELECTRICAL DISTRIBUTION LINES	2500 LF			
812 30CY	ELECTRICAL DISTRIBUTION LINES EXPED	2000 LF		NONE	
812 30CZ	ELECTRICAL DISTRIBUTION LINES EXPED	4000 LF		NONE	
812 30AE	ELECTRICAL DISTRIBUTION LINES-UGND	3500 LF		NONE	
812 30AF	ELECTRICAL DISTRIBUTION LINES-UGND	5000 LF		NONE	
812 30AT	ELECTRICAL DISTRIBUTION LINES-UGND	1875 LF		NONE	
812 30AX	ELECTRICAL DISTRIBUTION LINES-UGND	125 LF		NONE	
812 30BF	ELECTRICAL DISTRIBUTION LINES-UGND	250 LF		NONE	
812 30BG	ELECTRICAL DISTRIBUTION LINES-UGND	500 LF		NONE	
812 30BH	ELECTRICAL DISTRIBUTION LINES-UGND	5000 LF		NONE	
812 30BK	ELECTRICAL DISTRIBUTION LINES-UGND	4000 LF		NONE	
812 30BM	ELECTRICAL DISTRIBUTION LINES-UGND	2500 LF		NONE	
812 30BS	ELECTRICAL DISTRIBUTION LINES-UGND	7500 LF		NONE	
812 30CY	ELECTRICAL DISTRIBUTION LINES-UGND	1000 LF		NONE	
812 30E	ELECTRICAL DISTRIBUTION LINES-UGND	2000 LF		NONE	
812 30J	ELECTRICAL DISTRIBUTION LINES-UGND	875 LF		NONE	
812 30K	ELECTRICAL DISTRIBUTION LINES-UGND	750 LF		NONE	
812 30M	ELECTRICAL DISTRIBUTION LINES-UGND	2700 LF		NONE	
812 30P	ELECTRICAL DISTRIBUTION LINES-UGND	4000 LF		NONE	
812 30H	ELECTRICAL DISTRIBUTION LINES-UGND	750 LF		NONE	

CEIF0104

Figure 1-4.—Alphabetical index of facilities.

material, or stored material; and vibration from equipment, blasting, traffic, or other sources..

Materials used for sheeting and sheetpiling, bracing, shoring, and underpinning have to be in good serviceable condition. Timbers must be sound and free from large or loose knots and must be designed and installed to be effective to the bottom of the excavation.

Cross braces or trench jacks must be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts. Minimum requirements for trenching timbers are shown in figure 1-7.

PROJECT PLANNING

Throughout the life of a project, information that reflects the complete history and requirements for that project is being accumulated and updated. The project package is the collection of all information required to plan, schedule, monitor, and execute a project. During the construction phase of a project, inspection reports, field change reports, and numerous items of project correspondence are added to the project package to complete the project history file. This file is continually updated until the project is completed. The most critical part of this project package is the project planning package.

FACILITY 812 30AB PLANNING FACTOR NA SEP 15 88

ELECTRICAL DISTRIBUTION LINES -- UNDERGROUND 11000 FT

NAVFAC DRAWING NUMBER NONE MAJOR REV 04 14 78

ASSEMBLY	DESCRIPTION	ZONE	QTY	WEIGHT POUNDS	CUBIC FEET	DOLLAR VALUE	CONST EFFORT MANHOURS
32200	ELEC CONDUCTOR BURIAL 10AWG 1000FT		3	796.8	16.6	459.00	99
32203	ELEC CONDUCTOR BURIAL 1AWG 1500FT		3	1,948.4	27.3	1,161.63	144
32205	ELEC CONDUCTOR BURIAL 250MCM 1500FT		3	4,758.0	77.2	6,872.58	267
32227	SPLICE BOX FIBERGLASS W/COVER		2	278.1	33.1	1,364.92	14
		SHORT TON	MEAS TON				
	TOTAL NORTH (TEMPERATE)	3.9	3.9	7,781.3	154.2	9,558.13	524
	TOTAL TROPICAL (BASIC)	3.9	3.9	7,781.3	154.2	9,558.13	524

FACILITY 812 30AB PRIMARY UNIT OF MEASURE 11,000 LF SECONDARY UNIT OF MEASURE 0

CONST STD	LAPSED DAYS	LAND ACRES	POWER CONNECTED	KVA DEMAND	VOLTS	PHASE	WATER TOT GPD	WATER PEAK GPM	SEWER GPD	RECOV CODE
TEMP	0	.00	0	0	0	0	0	0	0	0

FUEL (GAL/30 DAYS) HEATING DSL	MOGAS	PWR GEN DSL
0	0	0

SKILLS MANHOURS

EA	BU	UT	CE	SW	EO	CM	NS
0	0	0	311	0	84	0	129

CEIF0105

Figure 1-5.—Assembly description of facility 812 30 AB, electrical distribution lines underground, 11,000 feet,

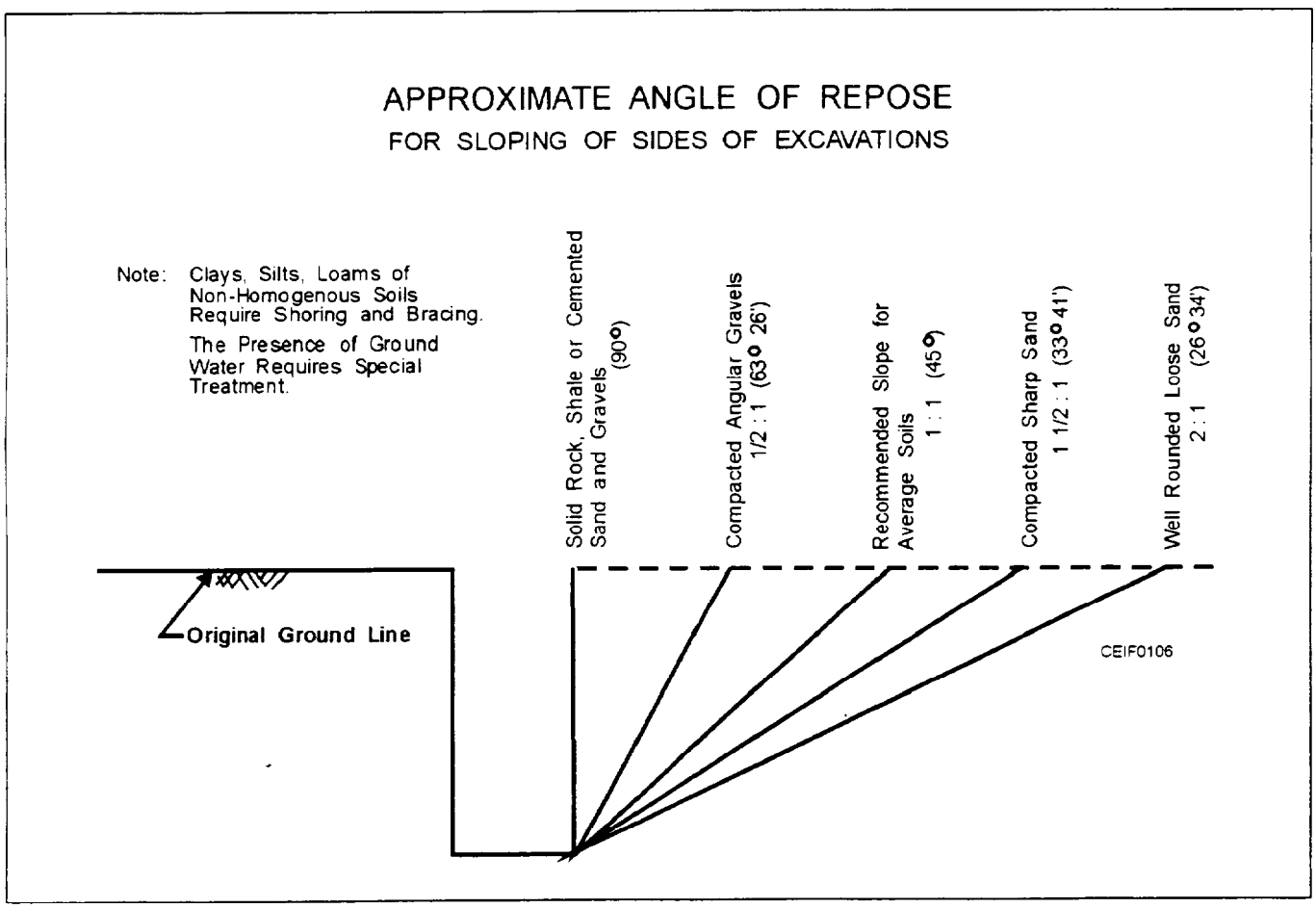


Figure 1-6.—Approximate angle of repose.

TRENCH SHORING -- MINIMUM REQUIREMENTS

Depth of trench	Kind or condition of earth	Size and spacing of members										
		Uprights		Stringers		Cross braces[1]				Maximum spacing		
						Width of trench						
		Minimum dimension	Maximum spacing	Minimum dimension	Maximum spacing	Up to 3 feet	3 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 15 feet	Vertical	Horizontal
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	3 x 4 or 2 x 6	6			2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Likely to crack	3 x 4 or 2 x 5	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Soft, sandy or filled	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Hydrostatic pressure	3 x 4 or 2 x 6	Close sheeting	3 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
10 to 15	Hard	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Likely to crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8		6
	Soft, sandy or filled	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
	Hydrostatic pressure	3 x 4 or 2 x 6	Close sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
15 to 20	All kinds or conditions	3 x 6	Close sheeting	4 x 12	4	4 x 12	6 x 8	8 x 8	8 x 10	10 x 10	4	6
Over 20	All kinds or conditions	3 x 6	Close sheeting	8 x 8	4	4 x 12	8 x 8	8 x 10	10 x 10	10 x 10	4	6

[1] Trench jacks may be used in lieu of, or in combination with, cross braces.
Shoring is not required in solid rock, hard shale, or hard slag.
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

CEIF0107

Figure 1-7.—Trench shoring-minimum requirements.

PROJECT PLANNING PACKAGE

The entire history of a Naval Construction Force (NCF) project is documented in the standard five-section project package. A list of the contents of the project package (Seabee Project Package) is shown in Table 1-4. A flowchart showing the sequence of planning steps is shown in figure 1-8. It is quite evident from looking at the contents of the project planning package and at figure l-8 that planning a project from the beginning to the end is an involved process. As a second class petty officer, you will be expected to prepare this type of project pack-age, to a certain extent. This manual covers just a few aspects of the project package folder. For more detailed information, you will need to study the *Seabee Crewleader's Handbook, Operations Officer's Handbook,* and *Seabee Planner's and Estimator's Handbook,* NAVFAC P-405 (Series).

The basic principle of the project package is to divide a project into smaller, controllable units and to set up a project history file. A project is usually received from the regiment level where it is divided into master activities. The next step is to further

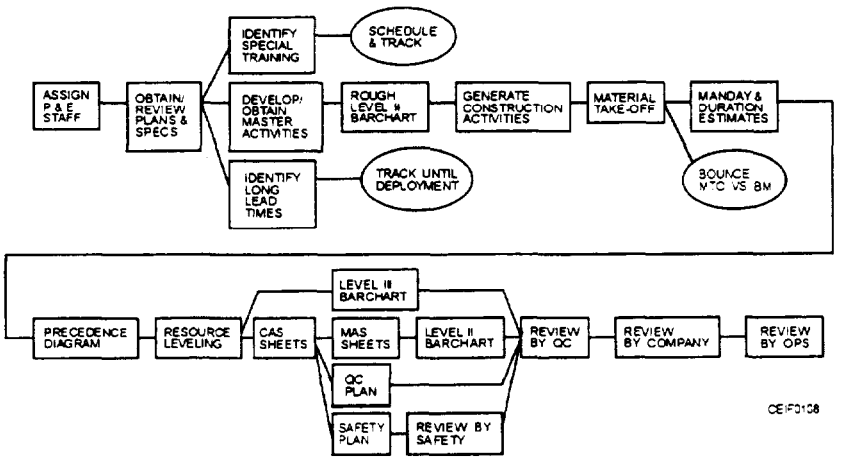


Figure 1-8.—Project planning flowchart.

Table 1-4.—Seabee Project Package

SEABEE PROJECT PACKAGE

(*Required on All Projects)
(**Requirement may be waived in a contingency: operation)

SECTION #1 GENERAL INFORMATION AND CORRESPONDENCE

1A
*Tasking Letter Correspondence
*Outgoing Messages and Correspondence
*Incoming Messages and Correspondence

1B
Project Scope Sheet
Project Organization
Project Planning Milestones
Project Package Sign-off Sheet
Deployment Calendar
Preconstruction Conference Summary
Predeployment Site Visit Summary
Joint Turnover Memorandum
Pre-BOD Inspection Request

SECTION #2 ACTIVITIES AND NETWORK

2A
*Level II Barchart
*Two Week Schedules
*Master Activity Listing
*Master Activity Summary Sheets
**Level III Precedence Diagram

2B
Level III Barchart
Construction Activity Summary Sheets (Recommended including filled out 1250-1 s.)
Construction Activity Summary Sheets on Completed Activities
Two Week Labor Summaries
SITREP Feeders
Other Computer Printouts/Reports

SECTION #3 RESOURCES

3A
*30/60/90-Day Material List
*30/60/90-Day Material List Letter

*Bill of Materials
*Tool Requirement Summary
*Equipment Requirement Summary

3B
List of Long Lead Items
Material Take Off Worksheets
Bill of Materials/Material Take Off Comparison Worksheets
Material Transfer Requests
Add On/Reorder Justification Forms
Add On/Reorder BMs
Borrow Log

Table 1-4.—Seabee Project Package—Continued

SECTION #4 PLANS

4A
*Quality Control Plan Cover Sheet
*Quality Control Plan
*Safety Plan Cover Sheet
*General Safety Plan
*Safety Plan
*Environmental Plan

4B
Daily Quality Control Inspection Reports
Field Adjustment Request (FAR) Submittal Log
FARs
Request For Information (RFI) Submittal Log
RFIs
Design Change Directive (DCD)
Concrete Placement Clearance Forms
Pre-placement Photos for Concrete Placements
Asphalt Pavement Clearance Forms
Utility Interruption Request
Excavation Request
Road Closure Request
Engineering Service Request
Minerals Products Request
Other QC Forms
Daily Safety Inspection Reports
Emergency Phone Numbers
Navy Employee Report of Unsafe or Unhealthful Working Conditions
Required Safety Equipment
Daily Safety Lecture Log
Accident/Near Mishap/Mishap Reports
Highlighted 29 CFR 1926
Hazardous Materials Inventory Sheet
Other Safety Forms

SECTION #5 DRAWINGS/SPECIFICATIONS

5A
*Project Plans
**Highlighted Specifications

5B
Site Layout
Shop Drawings
Detailed Slab Layout Drawings
Forming Plans
Rebar Bending Schedule
Other Sketches/Drawings
Technical Data

Table 1-5.—Information for a Precedence Activity (Typical Activity Block)

ACTIVITY NUMBER			ACTIVITY DURATION (DUR)
EARLY START (ES)	ACTIVITY DESCRIPTION ACTIVITY RESOURCES		EARLY FINISH (EF)
LATE START (LS)	TOTAL FLOAT (TF)	FREE FLOAT (FF)	LATE FINISH (LF)

break down the project into construction activities. This is normally done at the battalion level. From the construction activities, you will develop a logic network that will link the activities together into a sequence of events from the beginning to the end and will show the dependencies between the activities. Table 1-5 shows an activity block that represents a single construction activity.. This is the building block on which the whole project will be planned and controlled. The connection of these blocks and their interdependence on each other makes up a network diagram. The sum of these network diagrams is called a network analysis.

NETWORK ANALYSIS

A network analysis is a method of planning and controlling projects by recording their interdependence in diagram form. This enables each fundamental problem involved to be undertaken separately. The network diagram form is drawn in such a way that each job is represented by an activity on the diagram, as shown in figure 1-9. This network diagram is based on the installation of the generators shown in figure 1-10.

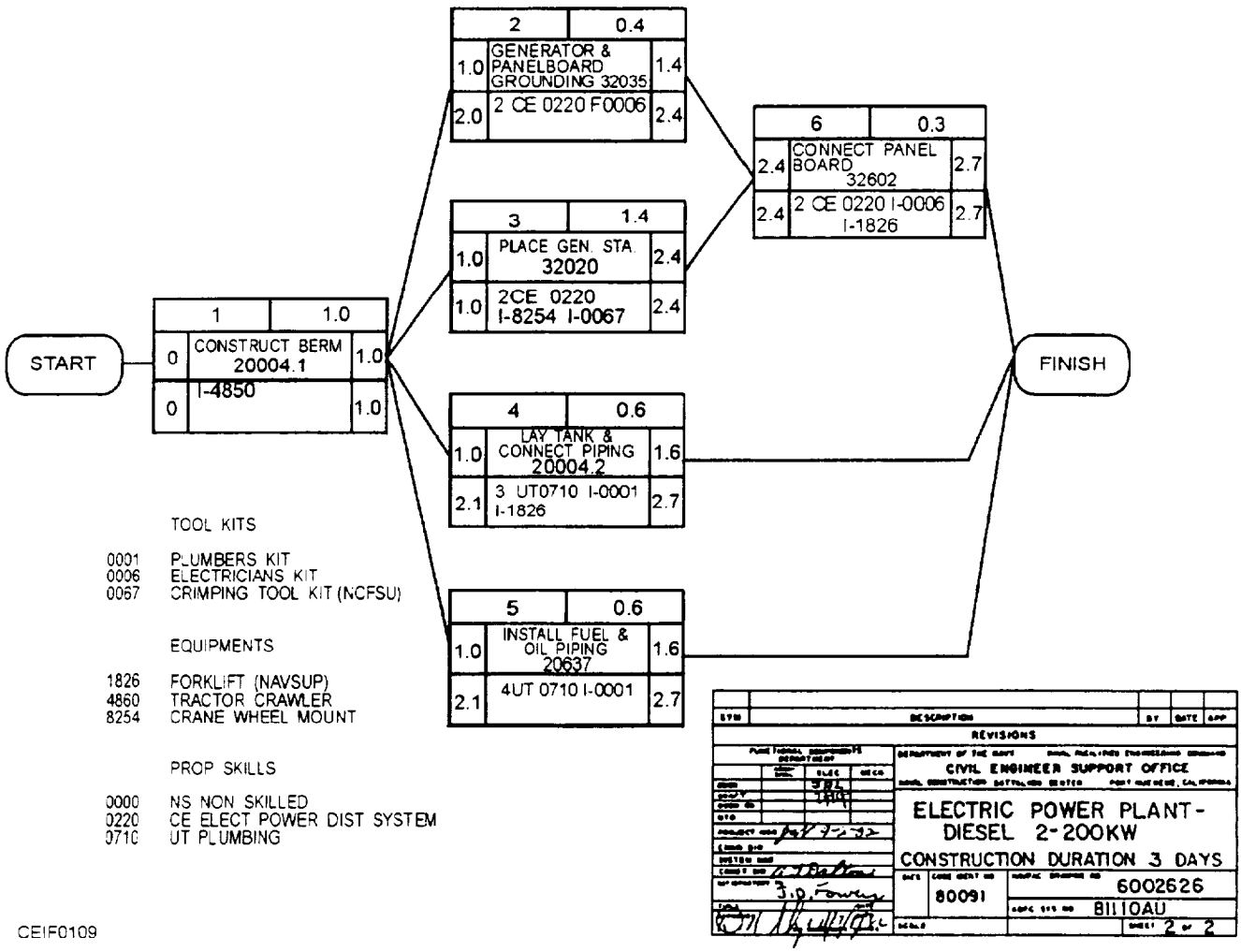


Figure 1-9.—Network diagram for installation of two 200-kilowatt generators.

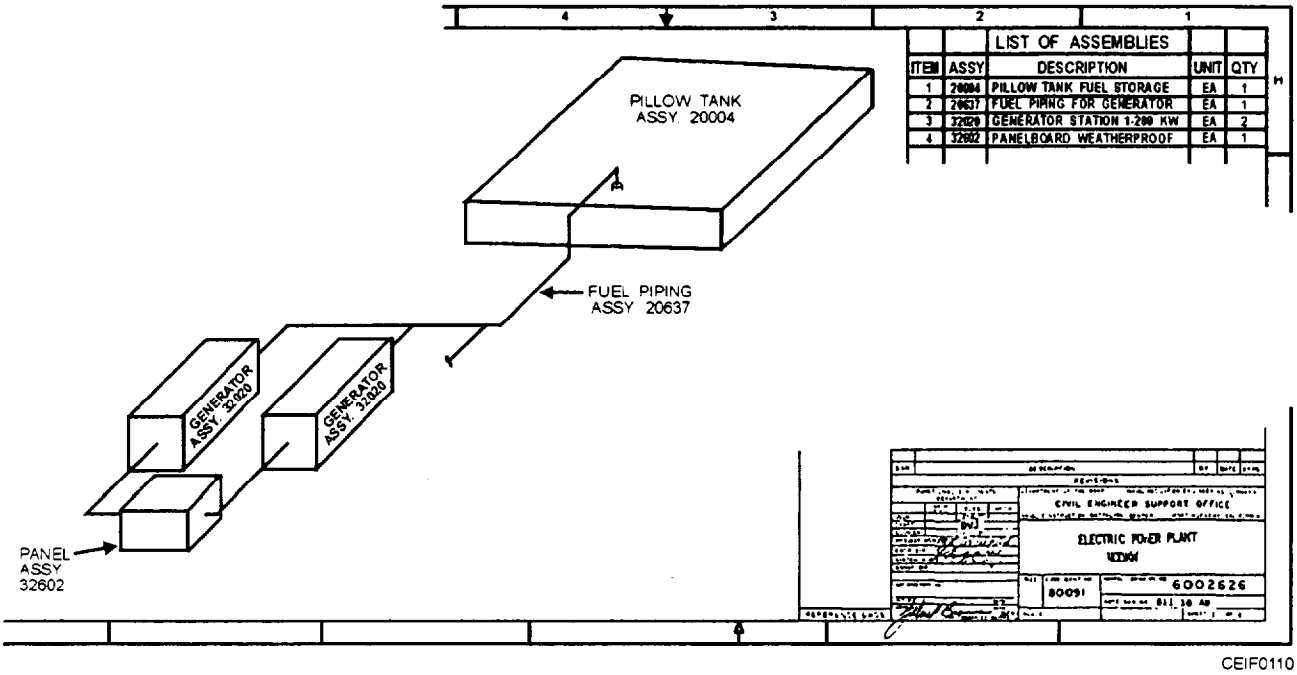


Figure 1-10.—Layout drawing for a 400-kilowatt electrical power plant.

Advantages

Network analysis has many advantages. As a management tool, it readily separates planning from scheduling of time. The diagram, a picture representation of the project, enables you to see the interdependencies between events and the overall project to prevent unrealistic or superficial planning. Resource and time restraints are easily adjustable to permit changes in the plan before its evaluation.

Because the system splits the project into individual events, estimates and lead times are more accurate. Deviations from the schedule are quickly noticed. Manpower, material, and equipment resources can be easily identified. Since the network remains constant throughout its duration, it is also a statement of logic and policy. Modifications of the policy are allowed, and the impact on events is assessed quickly.

Identification of the critical path is useful if the completion date has to be advanced. Attention can then be concentrated toward speeding up those relatively few critical events. The network allows you to accurately analyze critical events and provide the basis for the preparation of charts. This results in better control of the entire project.

Disadvantages

The only disadvantage of network analysis as a planning tool is that. when attempted manually, it is a tedious and an exacting task. Depending upon just what the project manager wants as output, the number of activities that can be handled without a computer varies, but the number is never high. If calculations are in terms of the sequence of activities only, a project involving several hundred activities may be attempted manually. However, the chance for error is high. The time required for manual operation would become costly. Various alternative plans also may be impossible because of the large volume of work.

On the other hand, a standard computer program for network analysis, CBCM 2.1, can handle project plans and management and give the user the flexibility to select different alternatives from a list of available menus.

The project manager, NOT the computer, is still responsible for planning and must make decisions based on information supplied by the computer. Computer output is only as accurate as its input, which is supplied by people.

TIMEKEEPING

Timekeeping and labor reporting are of great importance to the operation of Seabee units. While these are functions of both NCF units and public works activities, the discussion in this chapter is limited to NCF units. As a Seabee crew leader, you may be involved in the preparation of daily time cards. Therefore, you should know the types of information

called for on time cards and understand the importance of accuracy in labor reporting. Although the forms used for this purpose may vary slightly between NCF units, the discussion in this chapter will suffice as being typical.

LABOR ACCOUNTING SYSTEM

To record and measure the number of man-hours spent on various functions, a labor accounting system is mandatory. This system must permit the day-by-day accumulation of labor utilization data in sufficient detail and in a manner that allows ready compilation of information required by the operations department in the management of the manpower resources and in the preparation of various reports.

REPORTING

All labor expended in carrying out assigned tasks and functions must be accounted for. This accounting must include the work performed by the reporting unit and, when applicable, work performed by civilian labor and by military personnel of other activities. Labor expenditures must be accumulated under a number of reporting categories. This degree of reporting detail is required to provide the management data necessary to determine labor expenditures on project work. This data is necessary for calculation of statistical labor costs and comparison of actual construction performance with estimating standards. It also serves to determine the effectiveness of labor utilization in performing administrative and support functions, both for internal unit management and for development of planning standards by others.

Job Order Number

Each project that is assigned to the NCF for completion has a job order number (JON) assigned. This identification number is required for labor accounting and reporting purposes.

Time Cards

Time cards are the most accurate way to record actual man-days on a construction project. Cards allow you to monitor the efficiency and accountability of your crew. Cards are the basis of your report input; therefore, it is imperative that time cards are filled out correctly and accurately.

CREW SUPERVISOR'S REPORT

The standard form used for timekeeping is the Prime Time Card shown in figure 1-11. The time card is prepared by the crew leader for each phase of the construction project. The time card provides a breakdown by man-hours of the activities in the various labor codes for each crew member for any day on any project. Sub-contractor crew leaders will use the Sub Time Card shown in figure 1-12. Refer to COMSECONDNCB/COMTHIRDNCBINST 5312.1 for more detailed information on timekeeping and filling out time cards.

QUALITY CONTROL

The purpose of quality control is to prevent discrepancies and ensure the quality of workmanship

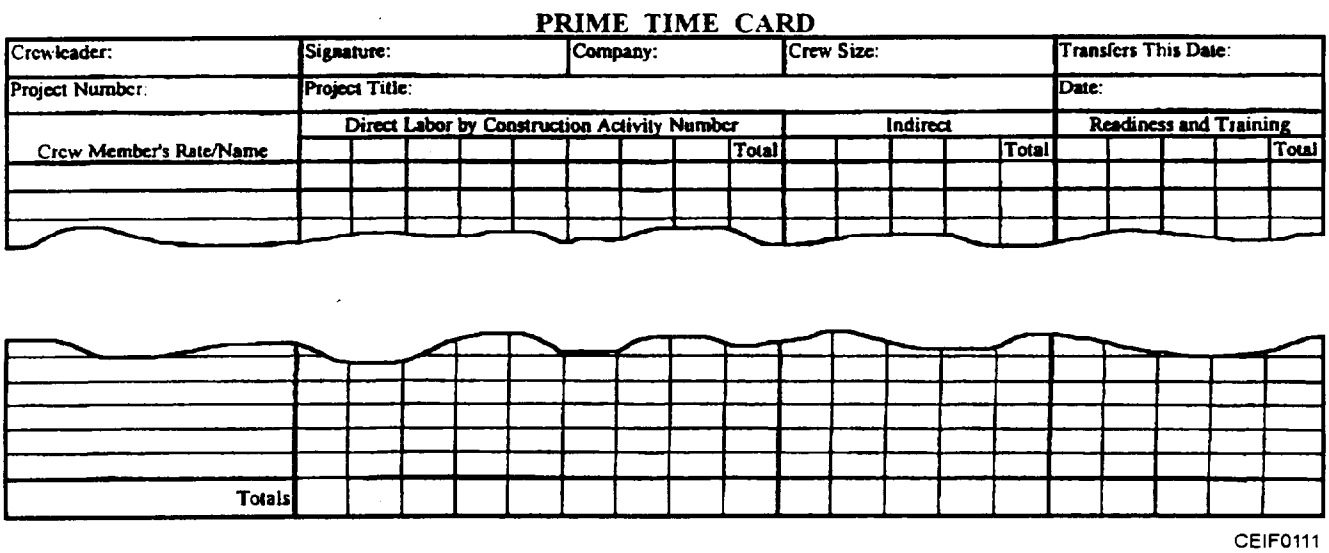


Figure 1-11.—Prime Time Card.

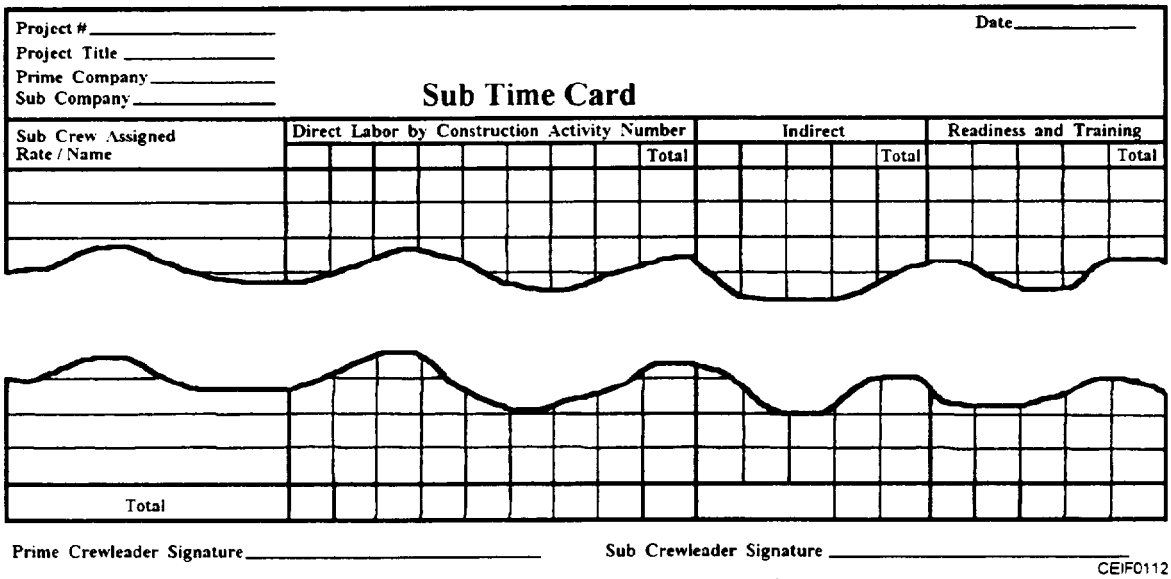


Figure 1-12.—Sub Time Card.

and materials meets the requirements in the plans and specifications. The responsibility for quality construction rests with the crew leader and the chain of command. The quality control division of the operations department is responsible for conducting tests and inspections to ensure compliance with the plans and specifications.

QUALITY CONTROL PLAN

The crew leader must develop and implement an aggressive quality control (QC) plan. The crew leader must plan quality into the project and avoid discrepancies. The development of the QC plan can be broken down into the following steps:

- Establish quality measures by reviewing the plans and specifications and identifying the quality criteria with which you must comply. The project QC plan should include a list of checks, inspections, and tests. You also need to address special requirements, such as training, hazardous material, or personnel safety pro-tection. See figures 1-13 and 1-14 for examples of QC planning guides.

- Select construction methods that are safe and of high quality. You need to determine construction methods very early in the planning stage of the project, as they impact on equipment, tools, material, labor, training, and safety requirements. Discuss construction methods with your crew, supervisors, and the QC inspector.

- Identify required training and equipment If specialized training or qualifications are needed, you must make sure they are met. Use the resources that are available to you, and remember that projects are intended as training for your people. Teaching your crew the proper construction methods and techniques should be high on your priority list.

- **Ensure personnel awareness.** To perform the work satisfactorily, the crew must understand the quality measures. Before beginning work on an activity, you should brief all crew members about critical measurements, inspection items, potential problems, and each member's responsibility for quality.

- **Evaluation of work completed** is recorded on a Daily QC Inspector's Report shown in figure 1-15. The purpose of this report is to document that the required checks, tests, and inspections were accomplished, and work is being performed according to specifications.

RESIDENT OFFICER IN CHARGE OF CONSTRUCTION (ROICC)

The ROICC is responsible for inspection and surveillance on NCF projects and for reviewing daily QC reports. The ROICC office also has to approve any recommended field changes or customer-requested changes. No field changes can be made without a request being forwarded through the QC department.

HAZARDOUS MATERIAL

As a second class petty officer and crew leader, you should be aware of the Navy's Hazardous Material (HM) and Hazardous Waste (HW) programs.

PROJECT QC PLAN

I. Project Number and Title:

II. Project Location:

III. Prime Contractor:

Subcontractor: (a)
(b)

IV. Project Scope:

V. Types of Testing Required (soil. concrete, etc.):

VI. Types of Associated Risk (fire, fumes, noise, etc.):

VII Special Training Requirements:

VIII. Special License Required:

IX. Engineering Controls (guard rails, welding curtains, etc.):

X. Testing Equipment Required (state how it is to be used):

Xl. Personal Protective Equipment Required for Testing:

Project Planner. _____
Print name, rate, and company/det

QC Chief: Approved/Disapproved _____
Signature

Reason for disapproval: _____

_____

CEIF0113

Figure 1-13.—Project QC plan.

QUALITY CONTROL PLAN

PROJECT NUMBER:_____ PROJECT TITLE:_____ DATE: _____

ACTIVITY NUMBER	ACTIVITY DESCRIPTION	QUALITY CONTROL REQUIREMENT	SPECIFICATION REFERENCE	REMARKS / RESULTS

CEIF0114

Figure 1-14.—Quality control plan.

DAILY QUALITY CONTROL INSPECTOR'S REPORT

Route to	Initial	Date	Remarks
S3			
S3C			
S3QC			
00S			
Prime			
Sub			

Date:	Time:	Project No.:	Report No.:
Prime Co.:		Project Title:	
Sub Co.:		Weather:	
Supervisor:		Inspector:	

Activity	Rate	Description of Work Performed

Activities Started:	Activities Completed:
QC Meetings Held: ____Yes ____No	
Construction Inspection Plan Items Checked:	Results:
Delays:	Safety Hazards Present:

Remarks:

Material Received:

I certify all work performed this date is IAW plans and specifications.

Project Supervisor QC Inspector Reviewed (S3QC)

Dist: 1. ROICC 2. QC File via S3 3. Prime Contractor 4. Crewleader

CEIF0115

Figure 1-15.—Daily Quality Control Inspector's Report.

Naval Construction Force Occupational Safety and Health Program Manual, COMSECONDNCB/ COMTHIRDNCBINST 5100.1, incorporates many naval instructions into a single document to establish policy, assign responsibility, promulgate, and implement the Naval Construction Force Occupational Safety and Health Program. Chapter 9 of this instruction deals with the Hazardous Material Control Program (HMCP). This Navy-wide program covers the proper storage, handling. usage. and disposal of HM. *Hazardous material.* as used in this instruction, follows the definition given for hazardous chemicals in 29 CFR 1910.1200 and Federal Standard 313B. Every command in the Navy will have an HMCP in place and each command will have the following responsibilities:

- Issue local instructions that incorporate the requirements of COMSECONDNCBICOMTHIRD-NCBINST 5100.1 and 29 CRF 1910.1200 into a written hazardous communication program.
- Develop and update, on an annual basis, a complete inventory of all HMs used at the command. Include in the inventory the location, quantity, stock number, chemical or common name. shelf life where appropriate, and disposal requirements for each HM.
- Develop and implement an HM information and training program.
- Have available for review an Material Safety Data Sheet (MSDS) as required in 29 CFR 1910.1200 for each HM used or stored.
- For HM purchased locally, obtain an MSDS, or equivalent data sheet. at the time of purchase.
- Maintain a complete file of MSDS on the matrials used, and make the MSDS or a worker-oriented summary of the MSDS information available to the users of the HM.
- Use the Type of Storage Codes listed in OPNAV-INST 5090.1 to determine safe storage. handling, and use.
- Report HM mishaps according to OPNAVINST 5102.1, chapters 3 and 4, as appropriate.
- Comply with all requirements for disposal of HM required by OPNAVINST 5090.1; Title 40, Code of Federal Regulations, Parts 122 and 260-267; and state and local regulations.
- Indicate the presence of any HM on all shore equipment, tanks, pipes, or other stationary objects.

The established uniform policy, guidance, and requirements for the life-cycle control and management of HM are Navy policy, and you play an important role in its success. The safety of personnel is a vital concern and is the responsibility of all supervisors. Safety and health considerations for individuals are a fundamental element in the operation of all construction, facilities, equipment, and training. Tight schedules and adverse working conditions must not be accepted as excuses for relaxation of safety standards."